

APPLICANTS: Melament et al  
SERIAL NO.: 10/697,186  
FILED: October 30, 2003  
Page 5

### **REMARKS**

The present response is intended to be fully responsive to all points of objection and/or rejection raised by the Examiner and is believed to place the application in condition for allowance. Favorable reconsideration and allowance of the application is respectfully requested.

Applicants assert that the present invention is new, non-obvious and useful. Prompt consideration and allowance of the claims is respectfully requested.

Although there was a discussion with the Examiner on October 15, 2006, in the detailed action section of this third office action, the Examiner refers only to the submission from August 14, 2006 and therefore this reply also ignores the October 15<sup>th</sup> discussion.

#### **Status of Claims**

Claims **1-3** and **5-14** are pending in the application.

Claims **1-3** and **5-14** have been rejected.

Claims **1, 6, 13** and **14** have been amended.

#### **The Telephone Interview**

Initially, Applicants wish to thank the Examiner, Ms. Yaima Campos, and the Supervisory Primary Examiner, Donald Sparks, for granting and attending the telephone interview, with Applicants' Representative, Suzanne Erez, Reg. No. 46,688, and Yoav Alkalay on January 16, 2007. In the interview, independent claim 1 was discussed, as were discussed the rejections under 35 USC §112 and 102(b). Clarifications to the terms "low" and "high" were discussed, and the independent claims have been amended in this paper above accordingly. The Examiners have agreed to enter this Amendment and to review the arguments made by the Applicant before issuing further action.

APPLICANTS: Melament et al  
SERIAL NO.: 10/697,186  
FILED: October 30, 2003  
Page 6

## CLAIM REJECTIONS

### 35 U.S.C. § 112 Rejections

In the office action, the examiner rejected claims **1-3** and **5-14** as being indefinite because of the relative terms "high" and "low". As discussed in the interview, independent claims **1, 6, 13** and **14** have been amended to clarify that the terms "high" and "low" performance or reliability involve a separation of at least one order of magnitude in performance or magnitude, respectively. Applicants respectfully assert that these amendments clearly define the terms "high" and "low" and therefore render claims **1, 6, 13** and **14** proper under 35 USC § 112. Accordingly, Applicants request that the rejections be withdrawn.

### 35 U.S.C. § 102 Rejections

In the Office Action, the Examiner rejected claims **1** and **6-14** under 35 U.S.C. § 102(b), as being anticipated by Ohran (US 2004/0034752, hereinafter "Ohran").

Applicants respectfully traverse the rejection of **1** and **6-14** under 35 U.S.C. § 102(b), as being anticipated by Ohran.

Applicants respectfully assert that Ohran does not teach or suggest a method of storage management including storing data on a high reliability high performance storage medium, backing up the data on a high reliability low performance storage medium, and after backing up, copying at least some of the data to a low reliability high performance storage medium, wherein the terms "high" and "low" performance or reliability involve a separation of at least one order of magnitude in performance or magnitude, respectively, as recited in independent claim **1** as amended. Similarly, Applicants respectfully assert that Ohran does not teach or suggest the storage system, program storage device, and computer program products as recited in amended independent claims **6, 13** and **14**.

In each of the independent claims **1, 6, 13** and **14** of the current application, a storage sequence is recited which includes data first being stored on a high reliability high performance storage medium, the data then being backed up on a high reliability low

performance storage medium, and then at least some of the data being stored on a low reliability high performance storage medium. The independent claims have been amended to clarify that the terms “high” and “low” performance or reliability involve a separation of at least one order of magnitude in performance or magnitude, respectively. Furthermore, independent claims 1, 6, 13 and 14 clearly indicate that a storage sequence is being recited.

For example, in claim 1, the words “backing up said data” indicate that the data which was stored on the high reliability high performance storage medium is then stored (i.e. backed up) on the high reliability low performance storage medium. Continuing with the example, in claim 1, the words “after said backing up” indicate that the storage of at least some of the data on the low reliability high performance storage medium occurs after the backing up onto the high reliability low performance storage.

The storage sequence with regard to various storage media differentiated in terms of performance and/or reliability as recited in each of independent claims 1, 6, 13 and 14 of the current application is neither indicated at nor hinted in Ohran as will be shown below.

Ohran describes a method and system for mirroring and archiving mass storage. More details are provided, for example, in the abstract:

A method and system for mirroring and archiving mass storage. A primary mass storage and a secondary mass storage are synchronized to contain the same data. Thereafter, a primary system tracks changes made to the primary mass storage. These changes are consolidated periodically into update files, the consolidations representing changes made to the primary mass storage during a time interval that ends when the primary mass storage is in a logically consistent state. These update files contain only those changes necessary to represent the modified state of the primary mass storage at the time of the update. The primary system then transfers the update files to a secondary system to bring the secondary mass storage current with the primary mass storage. The consolidation minimizes the amount of information that must be transferred and therefore allows for a relatively low band width communication channel. In addition, update files may be cached by the primary system so that requests for mirrored or archived data may be fulfilled by the primary system cache rather than requiring access to the secondary system.

The described system in Ohran comprises a primary storage, a secondary storage and optionally a cache holding area- see for example Figure 1.

APPLICANTS: Melament et al  
SERIAL NO.: 10/697,186  
FILED: October 30, 2003  
Page 8

In the discussion in Ohran of the primary storage and the cache holding area there is no differentiation between characteristics of the two memories, and certainly no discussion of any differences in reliability between the primary storage and the cache holding area. For example, the primary storage is described for example on page 5, paragraph 0048, and on page 5, paragraph 49 as follows:

The primary mass storage means can be any storage mechanism that stores data which is to be backed up using the present invention. For example, such mass storage means may comprise one or more magnetic or magneto-optical disk drives.

If the primary mass storage means is a RAM or other word or byte addressable storage device...

Similarly, the cache holding area is described for example on page 5, paragraph 50

As described in greater detail below, such cache holding means may comprise any type of writable storage device such as RAM, EEPROM, magnetic disk storage, and the like. Such cache holding means may also comprise a portion of primary mass storage **20**.

From the above quotes relating to the primary storage and cache holding area, it is clear that for the purposes of the invention of Ohran, the primary storage and cache holding area may have the same characteristics (for example because both may be RAM), and that the cache holding means may even comprise part of the primary storage. Certainly, no differentiation is described between the reliability of the primary storage and the cache holding area.

In addition, for the purposes of the invention of Ohran, the secondary storage has the following meaning as defined for example on page 5 paragraph 47:

Similarly, the term "secondary" merely identifies the system with attached mass storage means for mirroring and archiving the primary system 12.

In Ohran there is no explicit mention of required characteristics for the secondary storage. For example, for the purposes of Ohran's invention the secondary storage may

APPLICANTS: Melament et al  
SERIAL NO.: 10/697,186  
FILED: October 30, 2003  
Page 9

comprise a storage device identical to the storage device of the primary system (consequently having the same performance and reliability characteristics) – see for example page 5, column 52:

For example, secondary mass storage means may comprise a storage device identical to the mass storage device of a primary system. If the primary system has a large magnetic disk, for example, the secondary mass storage means may also comprise a large magnetic disk. As another example, secondary mass storage means may comprise archival storage devices such as a magnetic tape drive or an optical or magneto-optical drive. The type of storage devices that may be used for secondary mass storage means is limited only by the particular application where they are used. In some situations it may be more desirable to have a secondary mass storage means that more closely resembles the primary mass storage means. In other situations it may be perfectly acceptable to have archival type storage means that are optimized to store large amounts of data at the expense of rapid access. (underline added).

To summarize, in Ohran, the reliability of the various storage media including the primary storage, cache holding area, and secondary storage is not discussed. Certainly there is no indication that Ohran uses a low reliability storage medium at all. In addition, in Ohran, distinctions in performance among the various storage media are unnecessary and irrelevant.

Although as shown above, there is neither a hint nor an indication that the cache holding area of Ohran is a low reliability high performance storage medium, for the sake of completeness, Applicants would like to respectfully address the Examiner's statement in point 7 of the office action. In point 7 of the office action, the Examiner seemingly equates the cache holding area of Ohran to the low reliability high performance storage medium of the current invention.

Applicant would like to respectfully repeat that in the current invention the storage sequence includes the data first being stored on a high reliability high performance storage medium, the data next being backed up on a high reliability low performance storage medium, and then afterwards at least some of the data being stored on a low reliability high performance storage medium, wherein the terms "high" and "low" performance or reliability

APPLICANTS: Melament et al  
SERIAL NO.: 10/697,186  
FILED: October 30, 2003  
Page 10

involve a separation of at least one order of magnitude in performance or magnitude, respectively.

In contrast, in Ohran the data is first written to the primary storage- see for example page 8 paragraph 0074:

During normal operation of primary system 12, data is periodically written to attached primary mass storage 20

Alternatively in Ohran the data may be written directly to the cache holding area as stated for example in page 9 paragraph 0080:

If cache-holding area 22 is part of primary mass storage 30, there should be some mechanism for ensuring that tracked changes 60a, 60b, 60c, etc. are preserved only for changes made to that portion of primary mass storage 20 that is not included in cache-holding area 22,...

Then, in Ohran a copy of the update is placed in the cache holding area. Only after the copy of the update is placed in the cache holding area is the copy transferred to the secondary system. This order of first placing the update copy in the cache holding area and then transferring the update copy to the secondary system is repeated numerous times in Ohran, and no alternative to this order is mentioned. See for example page 9 paragraph 0078, 0082 and 0083:

The updates and tracked changes that are stored at cache-holding area 22 and that have not yet been sent to secondary system 14 constitute part of the mirrored data. For example, during the period of time between times T1 and T2, tracked changes 60b are part of the mirrored data. Moreover, if there is a delay in sending consolidated updates to secondary system 14, these consolidated updates remain in cache-holding area 22 and are part of the mirrored data. For instance, consolidated update 60a, if it has not yet been sent to secondary system 14 after time T1, is part of the mirrored data. (underline added).

Because updates stored in cache holding area 22 are not necessary for mirroring or archiving once they have been sent to the secondary system, the decision of which update to delete is primarily a performance consideration. However, updates that have not yet been sent to secondary system 14, because of transmission delays or otherwise, are still needed for purposes of mirroring, and should not yet be deleted (underline added)

APPLICANTS: Melament et al  
SERIAL NO.: 10/697,186  
FILED: October 30, 2003  
Page 11

Other than updates that have not yet been sent to secondary system 14, the contents of cache holding area 22 are not necessary for mirroring and archiving because secondary mass storage system 24 performs that function (underline added)

From the above quotes from Ohran, it is clear that storage of the update copy in the cache holding area precedes the storage of the update copy in the secondary storage. It is also noted that in Ohran the updates may be deleted from the cache holding area once they have been sent to the secondary system, further emphasizing that in Ohran the storage in cache precedes the storage in the secondary storage. As mentioned above, there is no discussion in Ohran of the reliability characteristics of the various storage media and certainly neither a hint nor an indication that the cache holding area of Ohran is a low reliability high performance storage medium. On the contrary, considering that there may be a delay in sending the updates to the secondary system, it is certainly more feasible to assume that the cache holding area in Ohran is a high reliability storage medium. However even if one would assume that the cache holding area of Ohran can be equated to the low reliability high performance storage medium of the current invention (as the Examiner seemingly equates in point 7 of this office action), the sequence of storage of Ohran does not match the storage sequence recited in the independent claims of the current invention. Recall that in the current invention, the storage in the low reliability high performance storage medium follows the storage in the high reliability low performance storage medium.

Based on the above discussion, Applicants respectfully assert that independent claims 1, 6, 13 and 14 as amended are allowable over Ohran. Claims 2, 3, 5, 7-12 depend from, directly or indirectly, claims 1, 6, 13 and 14 and therefore include all the elements of those claims. Therefore, Applicants respectfully assert that claims 2-3, 5, 7-12 are likewise allowable. Accordingly, Applicants respectfully request that the Examiner withdraw the rejections to independent claims 1, 6, 13 and 14, and to claims 2-4, 5, 7-12 dependent thereon.

APPLICANTS: Melament et al  
SERIAL NO.: 10/697,186  
FILED: October 30, 2003  
Page 12

Applicants believe the remarks presented hereinabove to be fully responsive to all of the grounds of rejection raised by the Examiner. In view of these remarks, Applicants respectfully submit that the specification and all of the claims in the present application are in order for allowance. Notice to this effect is hereby requested.

Respectfully submitted,

By: /Suzanne Erez/  
Suzanne Erez  
Reg. No. 46,688  
Phone No. (972) 829-6307

Date: 17 January 2007  
IBM Corporation  
Intellectual Property Law Dept.  
P. O. Box 218  
Yorktown Heights, New York 10598